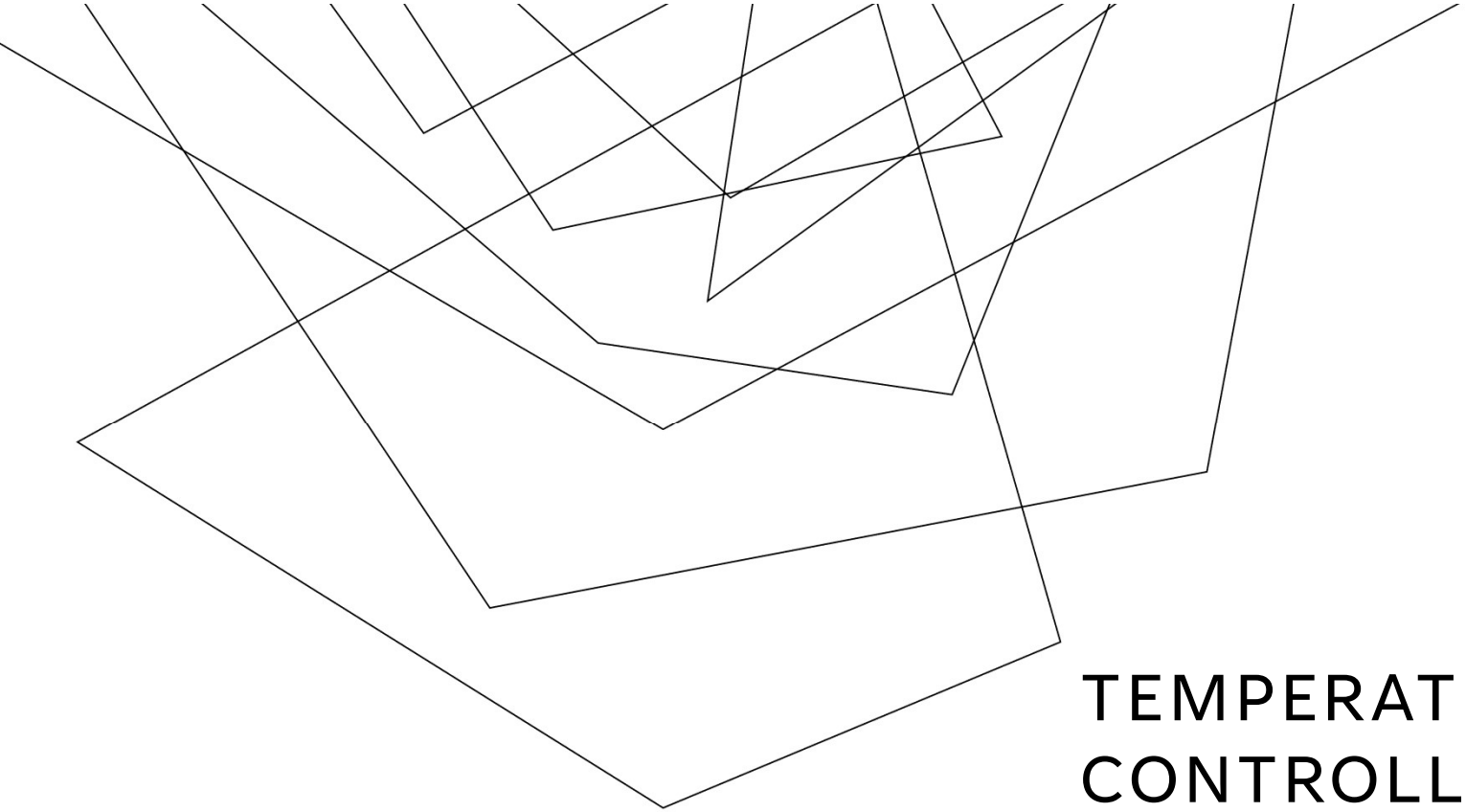


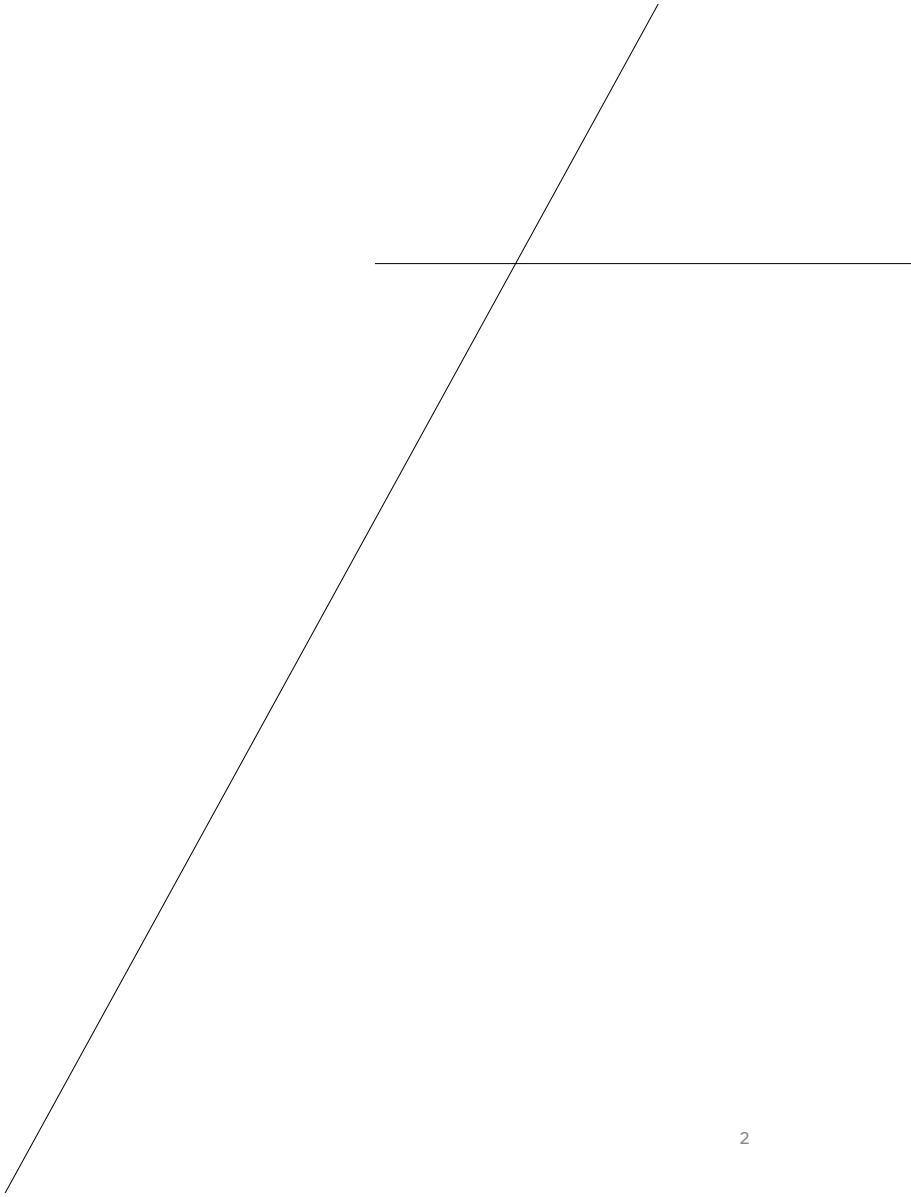
TEMPERATURE CONTROLLED FAN

Madeline Bohn

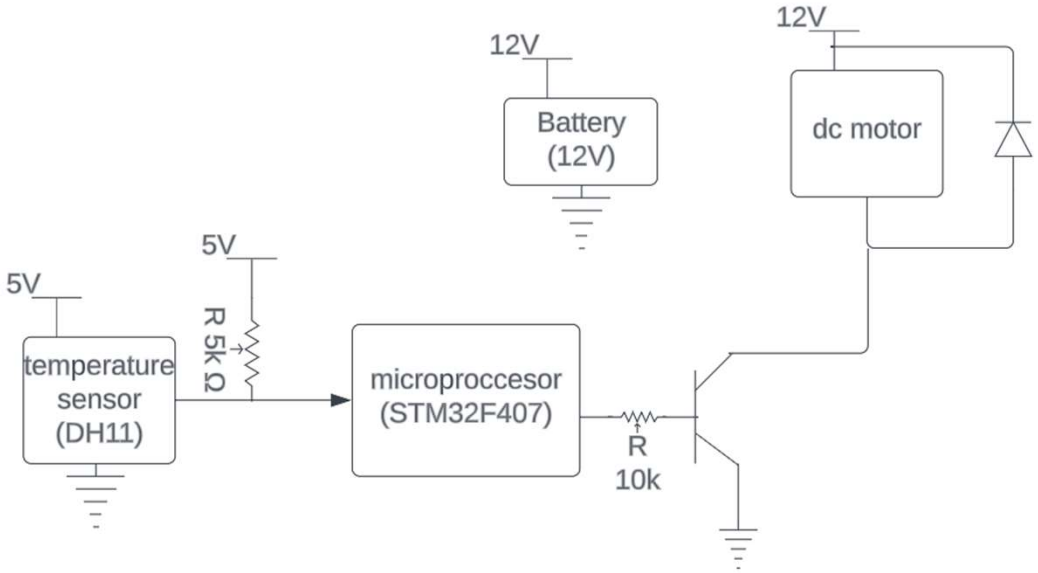
Embedded Systems Final Project

CONCEPT

- Build a fan to be controlled based on ambient temperature in a room
- Prototype on small fan attached to DC motor

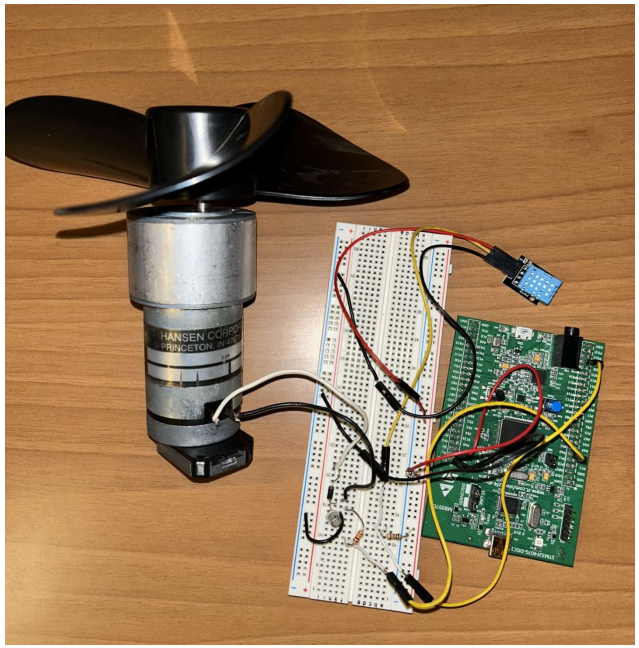


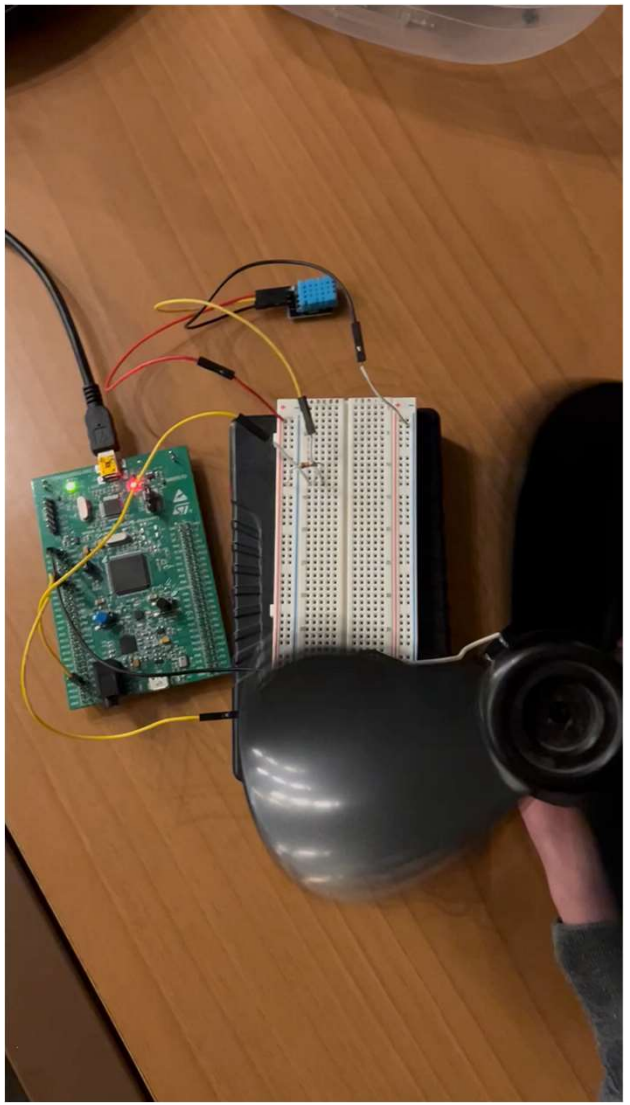
SYSTEM DESIGN

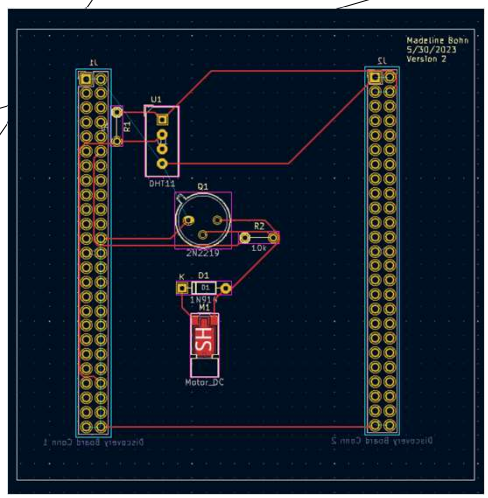


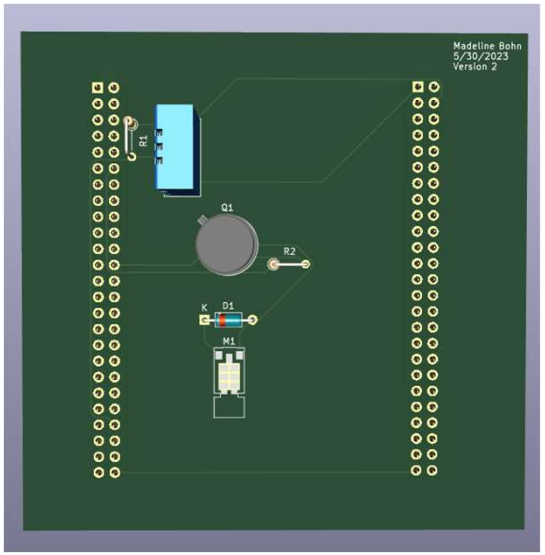
PROTOTYPE

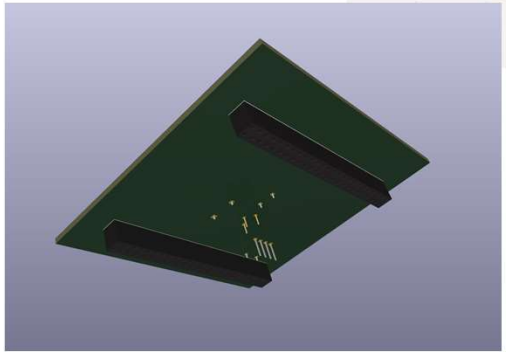
- DHT11 Temperature and Humidity Module (link)
  - Used to measure ambient temperature
- STM32F407 Discovery Kit board (link)
- Small fan (link)
- DC Motor (link)
- PN2222 Transistor (link)
- Resistors and diodes
- 12V Battery

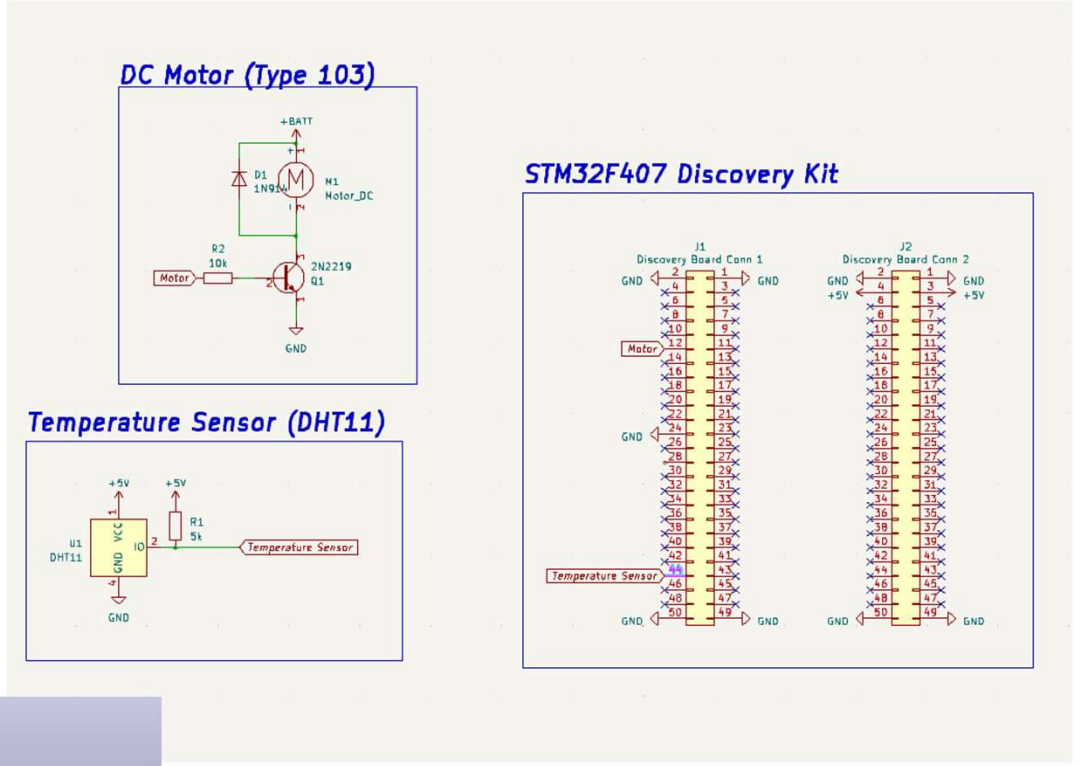





Madeline Bohn
5/30/2023
Version 2
J1
J2
U1
R1
DHT11
Q1
2N2219
R2
10k
K
D1
1N914
M1
Motor_DC
Discovery Board Conn 1
Discovery Board Conn 2

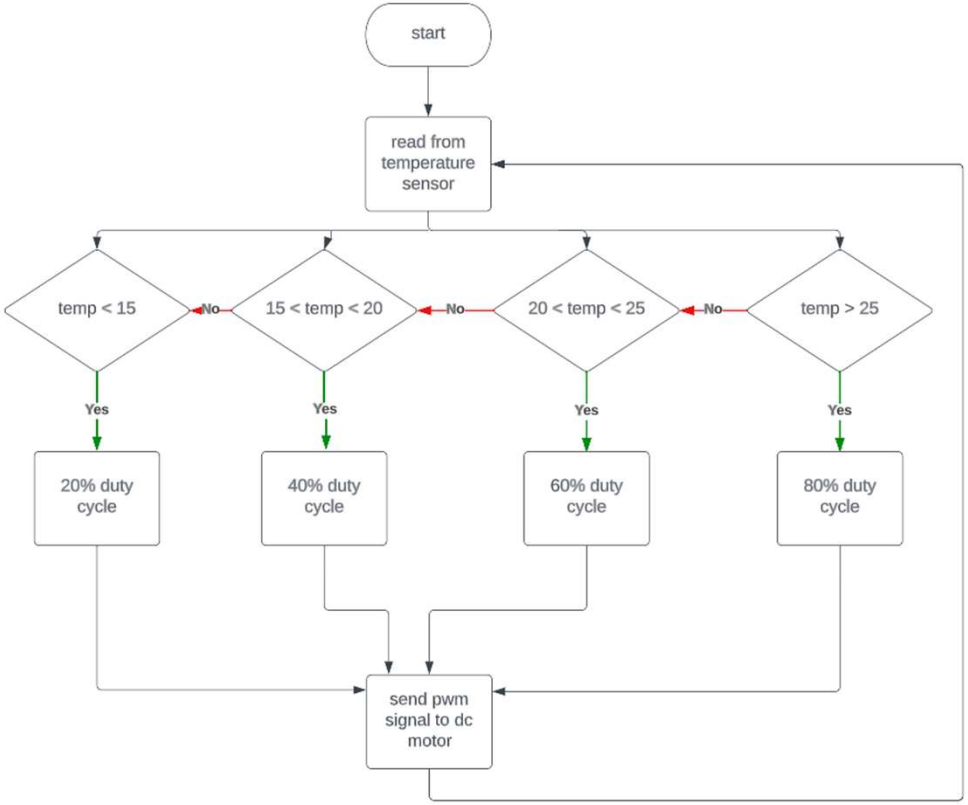

Madeline Bohn
5/30/2023
Version 2
R1
Q1
R2
K
D1
M1

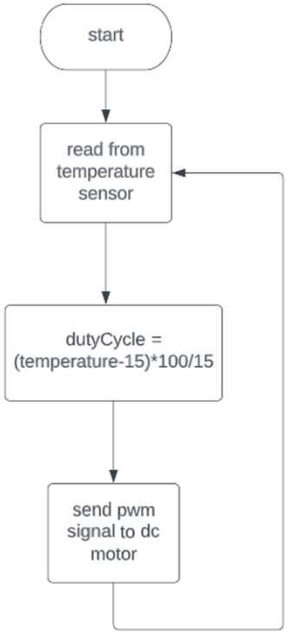



DC Motor (Type 103)
+BATT
D1
1N914
M1
Motor_DC
R2
10k
Motor
2N2219
Q1
GND
Temperature Sensor (DHT11)
+5V
+5V
U1
DHT11
VCC
GND
IO
R1
5k
Temperature Sensor
GND
STM32F407 Discovery Kit
J1
Discovery Board Conn 1
J2
Discovery Board Conn 2
GND
+5V
Motor
Temperature Sensor

PCB DESIGN

SOFTWARE DEVELOPMENT





```
while (1)
{

      DHT11_ReadData(&humidity, &temperature);
      if(temperature < T1){ //less than 15
          dutyCycle = 1;
          __HAL_TIM_SET_COMPARE(&htim2, TIM_CHANNEL_1, DUTY_CYCLE_1);
      }

      if((temperature > T1) && (temperature < T2)) //between 15 and 20
      {
          dutyCycle = 3;
          __HAL_TIM_SET_COMPARE(&htim2, TIM_CHANNEL_1, DUTY_CYCLE_2);
      }

      if((temperature > T2) && (temperature < T3)) //between 20 and 25
      {
          dutyCycle = 3;
          __HAL_TIM_SET_COMPARE(&htim2, TIM_CHANNEL_1, DUTY_CYCLE_3);
      }
      if(temperature > T3) //greater than 25
      {
          dutyCycle = 4;
          __HAL_TIM_SET_COMPARE(&htim2, TIM_CHANNEL_1, DUTY_CYCLE_4);
      }

    /* USER CODE BEGIN 3 */
  }
  /* USER CODE END 3 */
}
```

```
while (1)
{
    DHT11_ReadData(&humidity, &temperature);
    dutyCycle = (temperature-15)*100/15;
    __HAL_TIM_SET_COMPARE(&htim2, TIM_CHANNEL_1, dutyCycle);

  /* USER CODE BEGIN 3 */
}
/* USER CODE END 3 */
}
```

FUTURE CONSIDERATIONS....

- Continue working on getting the temperature sensor to better interface with the STM board as well as control the PWM in real time
- Implement a button and interrupt to start and stop the fan instead of using the battery switch
- Implement a display
- Implement potentiometer to control/set the desired room temp so the fan stops running